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Date: 15 Sep 08

Subject: Drafts for Public Comment–NIST Reports NCSTAR 1A and NCSTAR 1-9

Please accept and respond to the following comments on the subject reports.

Comment 1:

Since there was smoke emanating from the south face of WTC 7 from the time WTC 1 collapsed it is obvious there was fire in WTC 7 from that time. Given that the water main feeding the sprinkler system on the lower floors of the building was broken, what consideration was given to pumping water from the Hudson River or tank trucks into the system. If the sprinkler feed lines were not configured to receive water from such sources or the fire department was not equipped to inject water into the system from such sources, I would suggest that one of NIST's recommendations be that, to the extent technically feasible, sprinkler systems be configured to receive water from such sources and that fire fighters be equipped and trained to follow such a procedure where it would be advantageous.

Comment 2:

Since NIST's accepted WTC 7 collapse hypothesis is based on fire fighters not fighting the fires in the building, recognizing that the fire fighters were faced with unprecedented difficulties when the Twin Towers collapsed and they must have been disheartened by the loss of their comrades and focused on trying to save some of them, NIST's report should contain a much more detailed account of the people involved in the decision not to fight the fires , their levels of authority, and the items considered that led to the decision. I would suggest that NIST recommend that fire departments have a protocol that calls for bring to bear all available resources to contain and, if possible, suppress any fires that have the potential of spreading, even in the face of very demanding parallel activities.

Comment 3:

I found many structural and construction details missing or ambiguous in the NIST reports. I would very much like to see the details listed below included or revised in the report. If this would require NIST to seek out persons who actually created or dealt with the details, such effort should be expended.

Detail 1: The sizes, splices, and connections of the members in the perimeter support system are needed to explain the buildings stability under the assumed damage to its southwest corner. These details are missing and should be added.

Detail 2: Information on the lengths of the stud shear connectors should be included, along with when and how the studs were installed. If they were installed in the steel fabrication shop the procedure would probable have been much different that used in a field installation. This would have been particularly true if the steel floor pans were continuous over their supports and the studs were installed after the pans were in place.

Detail 3: Complete details on the installation of the steel floor pans should be included in the reports. The details should include the locations and sizes of all welds, the configuration and attachment details of closure dams use at the ends and edges of the pans to prevent concrete leakage, where and how much the pans overlapped their supports, and, if any were continuous over their supports, where the were continuous.

Detail 4: (See NIST NCSTAR 1-9, p. 350.) It is indicated that welded wire fabric was used in the concrete floors. The sizes and spacings of the wires in the fabric should be reported along with the vertical location of the fabric in the concrete. In addition, if the sizes or spacings of the wires in the fabric were asymmetrical, the installed orientation of the fabric should be reported.

Detail 5: It is not clear to me what the exact cross sections of the various floors were. Are the concrete slab dimensions given from the top, mid-height, or bottom of the steel floor pan incorporated in the floor structure. Dimensioned cross sections would be helpful.

Detail 6: Steel reinforced concrete is possible because of the relative compatibility of the coefficients of thermal expansion of steel and concrete, the texts of the NIST reports not withstanding. The aggregate used in a concrete, its initial water-cement ratio, and, probably, the type of cement used and the quantity of cement per unit volume will affect its coefficient of thermal expansion. The age of a concrete and, probably, the temperature range within which it undergoes a temperature change will also influence its coefficient of thermal expansion. Since NIST's WTC 7 collapse hypothesis is dependent on an assumption of a significant difference in the coefficients of thermal expansion between steel and concrete, it is essential that the concrete used in the WTC 7 floors be accurately described and its coefficient of thermal expansion determined and reported.

Detail 7: I did not find descriptions of the floor systems in the core areas of the building.

Even if these are given in the reports it would be helpful if drawings showing the details of these floor areas, along with details of how they transition to the floors outside of the core, were included in the reports.

Comment 4a:

At the heart of the NIST WTC 7 collapse hypothesis are two heat induced events that must happen together. The stud shear connectors on the floor beams carrying the floor in the northeast corner of floor 13 must fail, which in turn allows the floor beams to expand unidirectionally to the west and push the girders supporting them off their seats on column 79. Thus, the floor no longer being supported at column 79, it collapsed and caused successive floors below to collapse until a sufficient length of the column was stripped of its lateral support causing it to buckle, setting in motion a progressive collapse of the building. For all of this to happen girders carrying the floor beams must be free to move relative to the floor slab. In support of this possibly being the actual condition, NIST includes in its report (1-9, p. 343) part of a structural drawing sheet that calls for stud shear connectors on the floor beams and the spandrel girders between the perimeter columns but not on the girders framing into column 79. However, this partial drawing, which is described as "Based on erection drawing of Floors 12/13," is not conclusive. It is a small portion of a single sheet that was probably taken from a set of many sheets of drawings, possibly hundreds of sheets, supplemented by associated specifications. Instructions for installing stud shear connectors on the girders might have been included in notes and tables elsewhere in the documents. There are several references to notes on the partial sheet shown in the report. However, none of the notes are presented. In addition, the partial sheet shows member designations for the columns and the perimeter spandrel girders but not for the interior floor beams or girders, suggesting that the partial sheet might have come from a set of drawings that were in an intermediate stage of development. Frequently stud shear connectors are installed in the steel fabrication shop. However, for the safety of the steel workers who must walk on the steel, studs are often installed in the field after members have been erected and the slab floor pans or floor slab forms are in place. In the absence of eye-witness testimony, ideally supported by concrete placement pictures, or complete plans and specifications explicitly indicating that stud shear connectors were not to be installed on the girders, it is entirely possible that the partial drawing shown in the report shows connectors that were to be installed in the shop and studs on the girders were to be installed in the field. Even if studs were omitted from the girders, it is possible the attachment of the floor pans and dams to the girders could have resisted lateral movement of the girders–a point rather cavalierly dismissed by NIST at the top of page 9-1, 346.

Comment 4b:

The assumptions used in the finite element analysis presented to support the hypothesis that stud shear connectors failed are very questionable. The assumption that there would be no change in the shape of the concrete slab because of fixed edge conditions, while the floor beams were free to expand, but only westward because they

were assumed to be restrained from expanding to the east, seems quite unrealistic. The slab would have been soaking up heat for several hours and would probably have led or lagged the floor beams in temperature by only a little. Another flawed assumption, or possibly the same assumption just discussed stated in a different way, is illustrated in Figure 8-25 on page 9-1, 352, which describes input into the finite element analysis of the stud shear connectors. Here there is shown an implied nearly 600 °C temperature differential between a floor beam and the slab it supports. Presumably for computational efficiency, this temperature differential was assumed to develop in 1.25 seconds. This level of thermal shock is just not realistic. To summerize Comments 4a and 4b, NIST has not adequately supported the assumptions it has used in analyzing its WTC 7 collapse hypothesis and the hypothesis would certainly fail if stud shear connectors were actually installed on the girders framing into column 79 and would probably fail under a more nuanced and realistic set of assumptions.

Comment 5:

The NIST rejection of the possibility of WTC 7 having been brought down by controlled demolition can only be characterized as a strawman argument. NIST postulated a demolition procedure and then estimated that it would have produced more noise than was reported by witnesses. Later at the 21 September press conference rolling out the subject reports, when Dr. Sunder was asked about the possible use of quieter thermate-like demolition devices he speculated that too much demolition material would have been required. He estimated a hundred pounds would have been required per column. Using this estimate and assuming a belt-and-suspenders demolition crew chose to take out 15 columns they would only have needed 1500 pound of demolition material–the equivalent of about thirty boxes of printer or copier paper.

Comment 6:

As illustrated in my Comment 5, there is no technical basis for rejecting the possibility that WTC 7 was brought down by controlled demolition and, since its collapse looked exactly like a controlled demolition, it would seem that NIST should have devoted considerable time exploring the possibility of that having been exactly what happened. This it did not do and it should do it now.